

REMARKS

The present Amendment amends claims 8, 9, 14-16, 18, 19 and 21 and leaves claims 1-7, 10-13, 17, 20 and 22 unchanged. Therefore, the present application has pending claims 1-22.

The specification stands objected as requiring updating of the related applications. Amendments were made to the specification to update the related application information. Therefore, Applicants submit that this objection is overcome and should be withdrawn.

Claims 8, 9 and 14-22 stand objected to due to informalities noted by the Examiner in paragraph 6 of the Office Action. Various amendments were made throughout the claims to correct the informalities noted by the Examiner. Therefore, Applicants submit that this objection is overcome and should be withdrawn.

Claims 10-13 and 18 stand rejected under the judicially created doctrine of obviousness type double patenting as being unpatentable over claims 1, 3 and 7 of prior patent No. 5,956,750; and claims 1-3, 5 and 6 stand rejected under the judicially created doctrine of obviousness type double patenting as being unpatentable over claim 7 of the prior patent. Applicants do not agree with these rejections. However, in order to expedite prosecution of the present application filed on even date herewith is a Terminal Disclaimer so as to obviate these rejections. Accordingly, reconsideration and withdrawal of these rejections is respectfully requested.

It should be noted that the filing of the Terminal Disclaimer was not intended nor should it be considered as an agreement on Applicants part that the features of the present invention recited in claims 1-3, 5, 6, 10-13 and 18

are taught or suggested by claims 1, 3 and 7 of the prior patent. The filing of the Terminal Disclaimer was simply intended to expedite prosecution of the present application.

Claims 1-3, 5-15 and 18-20 stand rejected under 35 USC §102(b) as being anticipated by Jacobson (U.S. Patent No. 5,392,244); and claims 4, 16, 17, 21 and 22 stand rejected under 35 USC §103(a) as being unpatentable over Jacobson in view of Schultz (U.S. Patent No. 5,890,224). These rejections are traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1-22 are not taught or suggested by Jacobson or Schultz whether taken individually or in combination with each other as suggested by the Examiner. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw these rejections.

Claims 1-22 are directed to a storage system and reallocation method which operates in the storage system. According to the present invention, the storage system as illustrated, for example, in Figs. 1 and 2 includes at least two physical devices 105 storing data of a plurality of logical disk devices 200, wherein a logical disk device 200 is a target device of an access from a data processing unit 100 coupled to the storage system, and a controller 104 coupled to the data processing unit 100 for controlling data accesses from the data processing unit 100 to the logical disk devices 200. As per the claims, the controller 104 refers to access information 500 as per Fig. 6, of the present application about access activity to the logical disk devices 200 in the at least two physical devices 105, determines, in accordance with the access information 500, a first logical disk device allocated in at least one first

physical disk device having a first access activity and a second logical disk device allocated in at least one second physical device having a second access activity, wherein the first access activity is greater than the second access activity. Further, as per the claims, the controller transfers the first logical disk device from the at least one first physical disk device to the at least one second physical device and transfers the second logical device from the at least one second physical device to the at least one first physical and updates correlation between the logical disk devices and the physical disk devices.

The above described features of the present invention are illustrated, for example, in the attached Sketch 1, wherein the present invention provides a structure in which logical devices are each defined with respect to one or more physical disk devices. Further, according to the attached Sketch 1, the present invention provides that each logical disk device is recognized by the data processing unit as essentially a disk device upon which data is stored.

More importantly, According to the present invention as clearly recited in the claims "a logical disk device identified and designated for access by the data processing unit is reallocated to one or more physical disk devices from another one or more physical disk devices". Thus, the claims clearly recite the "movement of an entire logical disk device" from one physical disk device to another physical disk device. These features were recognized by the Examiner on page 8 of the May 15, 2003 Office Action of prior application Serial No. 10/112,865, filed April 2, 2002, now U.S. Patent No. 6,708,252 as not being taught or suggested by Jacobson.

Thus, the above described features of the present invention clearly recited in the claims are not taught or suggested by any of the references of record whether taken individually or in combination with each other. Particularly, the above described features of the present invention as recited in the claims are not taught or suggested by Jacobson or Schultz whether taken individually or in combination with each other as suggested by the Examiner.

The claims of the present application clearly recite that the invention involved the movement (reallocation) of an entire logical disk device, to which a processing unit seeks access, from one or more physical disk devices to another one or more physical disk devices rather than the transferring of data as per Jacobson. Jacobson merely teaches the transferring of a virtual block of data from a first area to a second area. At no point is there any teaching or suggestion in Jacobson that the transferring of a virtual block from a first area to a second area is in fact the transferring of a logical disk device from a first physical disk device to a second physical disk device to which the data processing unit seeks access as recited in the claims. The virtual block taught by Jacobson is clearly described as being a part of an Application or RAID view not a logical disk device as in the present invention.

More particularly, Jacobson teaches, as illustrated in the attached Sketch 2, a technique for transferring data from a first area to a second area by a structure including the first area for storing data in accordance with a first redundancy level (mirror) and a structure including the second area for storing data in accordance with a second redundancy level (parity). The Examiner's attention is directed to col. 2, lines 9-30 and Fig. 4 of Jacobson. Thus,

according to Jacobson, data is transferred from the first area to the second area according to a unit of virtual blocks 53 or allocation blocks 43 such as that illustrated, for example, in Fig. 4 of Jacobson. The Examiner's attention is also directed to the passage of Jacobson beginning at col. 7, line 50 to col. 7, line 10.

According to the teaching in Jacobson at col. 5, lines 38-46 and in Fig. 4, the RAID view 40 including allocation blocks 43 represents a single large storage space from the point of view of a user of an application program. Further, as taught by Jacobson the Application view 50 including virtual blocks 53 represents a single large storage capacity from the point of view of the user of an application program. The Examiner's attention is directed to col. 5, lines 61-68 of Jacobson.

However, at no point in Jacobson is there any teaching or suggestion that the allocation blocks 43 of the RAID view 40 and the virtual blocks 53 of the Application view 50 are identified or designated by the data processing unit, or for that matter the application program, as a logical disk device as in the present invention. The allocation blocks 43 of the RAID view 40 and the virtual blocks 53 of the Application view 50 of Jacobson are areas smaller than and included within the respective RAID view 40 and Application view 50 areas. These blocks are of course not logical disk devices as seen and accessed by the processor unit as in the present invention as recited in the claims.

Jacobson specifically teaches the transferring of data from a first area to a second area according to units of virtual blocks 53 or allocation blocks 43. The Examiner's attention is directed to col. 6, line 50 through col. 7, line 10 of

Jacobson. In the Office Action the Examiner incorrectly alleges that logical disk devices as recited in the claims of the present application correspond to the virtual blocks 53 or allocation blocks 43 as taught by Jacobson. Those of ordinary skill in the art would clearly recognize that a logical disk device does not correspond to a virtual or allocation block. A logical disk device is recognized and referred to by a processing unit as essentially being a physical device whereas a virtual block is recognized as merely being a page or a part of a virtual space. There is no intention in Jacobson that the virtual or allocation blocks are to have characteristics corresponding to a logical disk device as in the present invention as recited in the claims.

Thus, as is clear from the above, at no point is there any teaching or suggestion in Jacobson as illustrated, for example, in the attached Sketches 1 and 2 where a logical disk device is transferred from one physical disk device to another physical disk device and vice versa as in the present invention as recited in the claims, since the virtual and allocation blocks as taught by Jacobson are not logical disk devices as in the present invention. Jacobson merely teaches, for example, as illustrated in the attached Sketch 2, transferring a virtual block 53 or an allocation block 43 from one position in a virtual storage space to another position in a virtual storage space. There is absolutely no teaching or suggestion in Jacobson of logical disk devices as being formed relative to physical disk devices and the mutual transferring (reallocation) of such logical disk devices between different physical disk devices based upon access activity information as in the present invention as recited in the claims.

Thus, Jacobson fails to teach or suggest at least two physical disk devices storing data of a plurality of logical disk devices wherein a logical disk device is a target device of an access request from a data processing unit coupled to the storage system as recited in the claims.

Further, Jacobson fails to teach or suggest that the controller performs the steps of referring to access information about access activity to the logical disk devices in the at least two physical disk devices and determining, in accordance with the access information about access activity, a first logical disk device allocated in at least one first physical disk device having a first access activity and a second logical disk device allocated in at least one second physical disk device having a second access activity, wherein the first access activity is greater than the second access activity as recited in the claims.

Still further, Jacobson fails to teach or suggest that the controller performs the steps of transferring the first logical disk device from the at least one first physical disk device to the at least one second physical disk device and transferring the second logical disk device from the at least one second physical device to the at least one first physical device and updating correlation between logical disk devices and physical disk devices as recited in the claims.

Therefore, as is clear from the above, the features of the present invention as recited in the claims are not taught or suggested by Jacobson. Accordingly, reconsideration and withdrawal of the 35 USC §102(b) rejection of claims 1-3, 5-15 and 18-20 as being anticipated by Jacobson is respectfully requested.

The above noted deficiencies of Jacobson are not supplied by Schultz. Therefore, combining the teachings of Jacobson and Schultz in the manner suggested by the Examiner in the Office Action still fails to teach or suggest the features of the present invention as clearly recited in the claims.

Schultz is merely relied upon for an alleged teaching of utilizing a cache memory for transferring data between disks. However, this teaching of Schultz does not supply any of the above described deficiencies of Jacobson with respect to the use of logical disk devices being referred to by a data processing unit, the transferring of logical disk devices between physical disk devices and the transferring of such logical disk devices based upon access activity information as in the present invention as recited in the claims.

Therefore, the combination of Jacobson and Schultz fails to teach or suggest the features of the present invention as recited in the claims. Accordingly, reconsideration and withdrawal of the 35 USC §103(a) rejection of claims 4, 6, 16, 21 and 22 as being unpatentable over Jacobson in view of Schultz is respectfully requested.

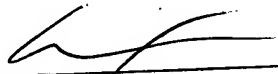
The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references utilized in the rejection of claims 1-22.

In view of the foregoing amendments and remarks, applicants submit that claims 1-22 are in condition for allowance. Accordingly, early allowance of claims 1-22 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER & MALUR, P.C., Deposit Account No. 50-1417 (500.35346CX3).

Respectfully submitted,

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